This document gives pertinent information concerning the **reissuance** of the VPDES permit listed below. This permit is being processed as a **Major, Municipal** permit. The effluent limitations contained in this permit will maintain the Water Quality Standards of 9 VAC 25-260-00 et.seq. The discharge results from the operation of a 1.25 MGD WWTP consisting of: Influent pump station, mechanical bar screen, aerated grit chamber, flow equalization basin, oxidation ditch, dual secondary clarifiers, dual aerobic digesters, sludge drying press, sludge storage facility, ultraviolet light disinfection facilities, postaeration facilities, totalizing, indicating, and recording effluent flow measuring facilities, and control building. This permit action consists of limiting pH, $CBOD_5$, suspended solids, ammonia nitrogen, E.coli, and dissolved oxygen; and including special conditions regarding compliance reporting, control of significant dischargers, whole effluent toxicity testing, and other requirements and special conditions. SIC Code: 4952.

1.   Facility Name and Address:
    Hillsville Wastewater Treatment Plant
    P.O. Box 545
    410 N. Main Street
    Hillsville, VA   24343

    Location:
    450 Cross Creek Road
    Hillsville, VA 24343

2.   **Permit No. VA0089443**
    (Previous) Effective Date: January 15, 2012
    (Previous) Expiration Date: January 14, 2017

3.   Owner Contact: Name: Retta Jackson
    Title: Town Manager
    Telephone No: 276-728-2128 E-mail: hillsville@townofhillsville.com

    Facility Contact: Name: Darrick Mayes
    Title: Utilities Director
    Telephone No: 276-728-5533

4.   Application Complete Date: 08/01/2016
    Permit Drafted By: Fred M. Wyatt   SWRO   Date: 08/02/2016
    Reviewed By: _Stve E. Artip_ Date: _8/15/2016_
    Public Comment Period Dates: from _____ to _____

5.   Receiving Stream Name: Little Reed Island Creek; River Mile: 9-LRIO-25.12: Basin: New River; Subbasin: None; Section: 2; Class: VI; Special Standards: None (v and NEW-5 are listed in the Water Quality Standards as special standards but are not applicable to this section).
    Latitude: $36^{o}47'13''$; Longitude: $80^{o}44'52''$

    7-Day, 10-Year Low Flow (7Q10): 8.8 MGD (June - Dec.)
    1-Day, 10-Year Low Flow (1Q10): 7.7 MGD (June - Dec.)

7Q10 High Flow: 12.7 MGD (Jan. - May)
1Q10 High Flow: 9.8 MGD (Jan. - May)
30-Day, 5-Year Low Flow (30Q5): 12.9 MGD
Harmonic Mean Flow (HM): 26.2 MGD

Tidal? No

On 303(d) list? Yes (See Item # 13 below)

6.   Operator License Requirements: Class II

7.   Reliability Class: III

8.   Permit Characterization:
      ( ) Private ( ) Federal ( ) State   (X) POTW   ( ) PVOTW
      ( ) Possible Interstate Effect   ( ) Interim Limits in Other Document

9.   Attach a schematic of wastewater treatment system, and provide a general
      description of the activities of the facility.

Discharge Description

OUTFALL NUMBER	DISCHARGE SOURCE (1)	TREATMENT (2)	FLOW (3)
001	Town of Hillsville	See Page 1 above, first paragraph	1.25 MGD

(1) List operations contributing to flow   (2) List treatment units
(3) Design flow

10.   Sewage Sludge Use or Disposal: The sludge is stabilized in dual aerobic
      digesters for 40 days. The sludge is then pumped to the belt filter
      press where it is conditioned using a polymer and dewatered. The sludge
      is hauled to the Carroll-Grayson-Galax Solid Waste Authority Landfill for
      final disposal.

11.   Discharge Location Description: See attached Hillsville, VA Quadrangle;
      Number: 052C

12.   Material Storage: None reported

13.   Ambient Water Quality Information: This segment of Little Reed Island
      Creek is impaired. This segment extends from the Rock Creek confluence
      upstream to the Hillsville public water supply intake, WQS Section 2.
      The segment is not supporting the recreation use and aquatic life use
      goals.

      The cause of the recreational use impairment is listed as E.coli and
      the sources are livestock (grazing or feeding operations), on-site
      treatment systems (septic systems and similar decentralized systems),
      and unknown sources. A bacterial TMDL is scheduled to be developed by
      2020.

The cause of the aquatic life use impairment is listed as water temperature and the source is loss of riparian zone. A temperature TMDL is scheduled to be developed by 2020.

14. Antidegradation Review & Comments: Tier I   Tier II (X)   Tier III
The State Water Control Board's Water Quality Standards includes an antidegradation policy (9 VAC 25-260-30). All state surface waters are provided one of three levels of antidegradation protection. For Tier I or existing use protection, existing uses of the water body and the water quality to protect these uses must be maintained. Tier II water bodies have water quality that is better than the water quality standards. Significant lowering of the water quality of Tier II waters is not allowed without an evaluation of the economic and social impacts. Tier III water bodies are exceptional waters and are so designated by regulatory amendment. The antidegradation policy prohibits new or expanded discharges into exceptional waters. The antidegradation review begins with a Tier determination. The receiving stream is Tier II, since the original effluent limitations for the 1.25 MGD facility were based on the requirements for Tier II waters.

15. Site Inspection: Technical Inspection on 11/06/2014 by Allen Cornett.

16. Effluent Screening & Limitation Development:

a. *pH:* A pH range of 6.0 – 9.0 standard units is assigned to Class VI waters per the Virginia Water Quality Standards.

b. *Biochemical Oxygen Demand BOD$_5$ and Dissolved Oxygen:* The staff used the steady state Streeter Phelps Regional Modeling System (V 4.0) to project acceptable dissolved oxygen and biochemical oxygen demand. The 7Q10 flow frequency was used in these calculations. TKN values were used in the model instead of ammonia nitrogen values.

c. *Total Suspended Solids:* Total Suspended Solids effluent concentrations are 30 mg/l monthly average and 45 mg/l weekly average, which are the minimum Federal secondary treatment levels.

d. *Ammonia Nitrogen:* On May 20, 2002, the VPDES Permit was modified to substitute total kjeldahl nitrogen (TKN) limitations (tiered for both low flow and high flow periods) with equivalent ammonia nitrogen limitations and to reduce the monitoring frequency from 5 days per week (for TKN) to one day per week (for ammonia nitrogen).

e. *E.coli Bacterial Standards:* A geometric mean 126 n/100 ml is assigned to Class VI waters, per the Virginia Water Quality Standards.

Since the receiving stream flows have not significantly changed since the previous issuance, effluent limitations are not being reevaluated in this reissuance.

The permittee has completed the chemical monitoring required in PART D. of the application Form 2A. No water quality violations were detected. However, water quality criteria effluent monitoring (Attachment A) is being required in this reissuance permit since it includes several parameters in the Virginia Water Quality Standards that are not included in PART D. of Form 2A.

Basis for Effluent Limitations

PARAMETER	BASIS FOR LIMITS *	DISCHARGE LIMITS**					MONITORING REQUIREMENTS	
		MONTHLY AVERAGE	WEEKLY AVERAGE	MINIMUM	MAXIMUM	FREQUENCY	SAMPLE TYPE	
Flow	NA	NL	NA	NA	NL	Continuous	Totalizing, Indicating & Recording	
PH	2	NA	NA	6.0 SU	9.0 SU	1/Day	Grab	
$CBOD_5$ (June 1 – Dec. 31)	1,5	20 mg/l 95 kg/d	30 mg/l 140 kg/d	NA	NA	3 Days/Wk.	24 Hour Comp.	
$CBOD_5$ (Jan. 1 – May 31)	1,5	25 mg/l 120 kg/d	38 mg/l 180 kg/d	NA	NA	3 Days/Wk.	24 Hour Comp.	
Total Suspended Solids	1	30 mg/l 140 kg/d	45 mg/l 210 kd/d	NA	NA	3 Days/Wk.	24 Hour Comp.	
NH_3-N (June- Dec.)	2,5	4.3 mg/l	4.3 mg/l	NA	NA	1 Day/Wk.	24 Hour Comp.	
NH_3-N (Jan.-May)	2,5	9.0 mg/l	9.0 mg/l	NA	NA	1 Day/Wk.	24 Hour Comp.	
E.coli (n/100 ml)***	2	126*	NA	NA	NA	3 Days/Wk. ****	Grab	
Dissolved Oxygen	2,5	NA	NA	7.0 mg/l	NA	1/Day	Grab	

* 1. Federal effluent guidelines
  2. Water quality-based limits:
  3. Best engineering judgement
  4. Best professional judgement
  5. Other (e.g. wasteload allocation model)

** Express limits in units of concentration (mg/l) and/or mass (kg/d)
*** Geometric Mean
**** Between 10:00 a.m. and 4:00 p.m.

16. Basis for Sludge Use & Disposal Requirements : VPDES Permit Regulation, 9VAC25-31-100 P; 220 B.2.; and 420 through 720, and 40 CFR Part 503 require all treatment works treating domestic sewage to submit information on sludge use and disposal practices and to meet specified standards for sludge use and disposal.

17. Antibacksliding Statement: Since no effluent limitations are being

relaxed in this reissuance, the antibacksliding provisions of the Permit Regulation (9 VAC 25-31-220.1) do not apply.

19. Compliance Schedule: NA

20. Special Conditions:

PART I.B. Special Condition - Compliance Reporting
Rationale: Authorized by VPDES Permit Regulation, 9VAC25-31-190 J 4 and 220 I. This condition is necessary when pollutants are monitored by the permittee and a maximum level of quantification and/or a specific analytical method is required in order to assess compliance with a permit limit or to compare effluent quality with a numeric criterion. The condition also establishes protocols for calculation of reported values.

PART I.C. Special Condition – Control of Significant Dischargers
Rationale: VPDES Permit Regulation, 9VAC25-31-730 through 900, and 40 CFR part 403 require certain existing and new sources of pollution to meet specified regulations.

PART I.D. Whole Effluent Toxicity Testing
Rationale: VPDES Permit Regulation, 9 VAC25-31-210 and 220 I, requires monitoring in the permit to provide for and assure compliance with all applicable requirements of the State Water Control Law and the Clean Water Act.

PART I.E. Other Requirements and Special Conditions

1. **95% Capacity Reopener**
Rationale: Required by VPDES Permit Regulation, 9VAC25-31-200 B 4 for all POTW and PVOTW permits

2. **Indirect Dischargers**
Rationale: Required by VPDES Permit Regulation, 9VAC25-31-200 B 1 and B 2 for POTWs and PVOTWs that receive waste from someone other than the owner of the treatment works.

3. **CTC, CTO Requirement**
Rationale: Required by the Code of Virginia § 62.1-44.19: Sewage Collection and Treatment Regulations, 9VAC25-790.

4. **Operation and Maintenance Manual Requirement**
Rationale: Required by the Code of Virginia § 62.1-44.19: Sewage Collection and Treatment Regulations, 9VAC25-790; VPDES Permit Regulation, 9VAC25-31-190

5. **Licensed Operator Requirement**
Rationale: The VPDES Permit Regulation, 9VAC25-31-200 C and the Code of Virginia § 54.1-2300 et seq, Board for Waterworks and Wastewater Works

6. **Reliability Class**
Rationale: Required by the Sewage Collection and Treatment Regulations, 9 VAC25-790 for all municipal facilities.

7. **Treatment Works Closure Plan**
Rationale: This condition establishes the requirement to submit a closure plan for the treatment works if the treatment facility is being replaced or is expected close. This is necessary to ensure treatment works are properly closed so that the risk of untreated waste water discharge, spills, leaks, or other exposure to raw materials is eliminated and water quality is maintained. Section 62.1-44.21 requires every owner to furnish when requested plans, specifications, and other pertinent informations as may be necessary to determine the effect of the wastes from this discharge on the quality of state waters, or such other information as may be necessary to accomplish the purpose of the State Water Control Law.

8. **Section 303(d) List (TMDL) Reopener**
Rationale: Section 303(d) of the Clean Water Act requires the total maximum daily loads (TMDLs) be developed for streams listed as impaired. This special condition is to allow the permit to be reopened if necessary to bring it in compliance with any applicable TMDL approved for the receiving stream. The reopener recognizes that, according to Section 402(o(1)of the Clean Water Act, limits and/or conditions may be either more or less stringent than those contained in the permit. Specifically, they can be relaxed if they are the result of a TMDL, basin plan, or other wasteload allocation prepared under Section 303 of the Act.

9. **Sludge Reopener**
Rationale: Required by VPDES Permit Regulation, 9VAC25-31-220 C for all permits issued to treatment works treating domestic sewage.

10. **Sludge Use and Disposal**
Rationale: VPDES Permit Regulation, 9VAC25-31-100 P; 220 B.2.; and 420 through 720, and 40 CFR Part 503 require all treatment works treating domestic sewage to submit information on sludge use and disposal practices and to meet specified standards for sludge use and disposal.

11. **Water Quality Criteria Monitoring in Attachment A**
Rationale: State Water Control Law §62.1-44.21 authorizes the Board to request information needed to determine the discharge's impact on State waters. States are required to review data on discharges to identify actual or potential toxicity problems, or the attainment of water quality goals, according to 40 CFR Part 131, Water Quality Standards, subpart 131.11. To ensure that water quality criteria are maintained, the permittee is required to analyze the facility's effluent for the substances noted in Attachment A of this VPDES permit.

PART II, Conditions Applicable to All Permits
Rationale: VPDES Permit Regulation, 9 VAC 25-31-190 requires all VPDES permits to contain or specifically cite the conditions listed.

21.   Changes from the previous permit contained in the reissued permit:

This permit has been drafted using guidance provided in the March 27, 2014 permit manual which is updated on a continual basis, resulting in minor changes to permit requirements and conditions.

PART I C.1. – The quantification level (QL) for BOD_5 has been changed from 5 mg/l to 2 mg/l in accordance with recommendations from the Office of Water Permits and Standard Methods 22_{nd} Edition.

The special condition for submittal of an operations and maintenance Manual has been updated and dose not require DEQ approval unless requested by DEQ.

Water Quality Criteria Monitoring and Attachment A are being included since this testing was not required in the previous permit.

In accordance with current agency policy to make the effective date of permits the first day of the month, the effective date of the reissued permit will be February 1, 2017 instead of January 15, 2017, based on the current expiration date. The existing permit is being administratively continued by DEQ to cover this gap.

PART II (boilerplate) of the permit has been updated to comply with the March 27, 2014 updated permit manual:

A.1.c – Added VELAP special condition which requires samples to be analyzed in accordance with 1VAC30-45, Certification for Noncommercial Environmental Laboratories, or 1VAC30-46, Accreditation for Commercial Environmental Laboratories per VPDES Permit Manual.

A.2. – Clarified that operational or process control samples or measurements do not need to follow procedures approved under Title 40 Code of Federal Regulations Part 136 or be analyzed in accordance with 1VAC30-45, Certification for Noncommercial Environmental Laboratories, or 1VAC30-46, Accreditation for Commercial Environmental Laboratories.

I.3. – Added language which allows for the Reporting of Non-Compliance activities to be submitted online in addition to reporting them by means of a telephone call.

22.   Variances/Alternate Limits or Conditions: None

23.   Regulation of Users: 9 VAC 25-31-280 B 9 - NA

24.   Public Notice Information required by 9 VAC 25-31-280 B:

HOW TO COMMENT AND/OR REQUEST A PUBLIC HEARING: DEQ accepts comments and requests for public hearing by hand delivery, e-mail, fax or postal mail. All comments and requests must be in writing and be received by

DEQ during the comment period. Submittals must include the names, mailing addresses and telephone numbers of the commenter/requester and of all the persons represented by the commenter/requester. A request for a public hearing must also include; 1) The reason why a public hearing is requested. 2) A brief, informal statement regarding the nature and extent of the requester or of those represented by the requester, including how and to what extent such interest would be directly and adversely affected by the permit. 3) Specific references, where possible, to terms and conditions of the permit and suggested revisions. A public hearing may be held, including another comment period, if public response is significant, based on individual requests for a public hearing, and there are substantial, disputed issues relevant to the permit.

CONTACT FOR PUBLIC COMMENTS, DOCUMENT REQUESTS AND ADDITIONAL INFORMATION:
Name: Fred M. Wyatt
Address: DEQ, Southwest Regional Office, 355-A Deadmore Street, Abingdon, VA 24210; Phone: (276) 676-4810 E-mail: frederick.wyatt@deq.virginia.gov Fax: (276) 676-4899

25. Additional Comments:

Permit History: VPDES Permit No. VA0089443 for this facility was issued on January 14, 1997, was reissued on January 14, 2002, was modified on May 20, 2002, was reissued on January 15, 2007 and January 15, 2012, and has an expiration date of January 14, 2017.

Threatened or Endangered Species: According to the printout from the Virginia Fish and Wildlife Information Service, no threatened or endangered species have been identified within a two mile radius of the discharge. The Virginia Water Quality Standards' halogen ban does not list this stream. This facility is not on the DEQ list for review by the DGIF, the Department of Conservation and Recreation (DCR) or the US Fish and Wildlife Service (USFWS), and the reissuance is not being coordinated with these agencies.

Federal Storm Water Regulations: The permittee has complied with the Phase 2 requirements by submitting a VIRGINIA DEQ NO EXPOSURE CERTIFICATION FOR EXCLUSION FROM VPDES STORM WATER PERMITTING.

Permit Fee: A permit fee is not required. Only an annual maintenance fee is required to be paid by October 1 of each year.

Previous Board Action: None

Staff Comments:

Public Comment:

26. TMDL: NA

PLANNING CONCURRENCE FOR MUNICIPAL VPDES PERMIT

PERMIT NO. VA0089443

FACILITY: Hillsville Wastewater Treatment Plant
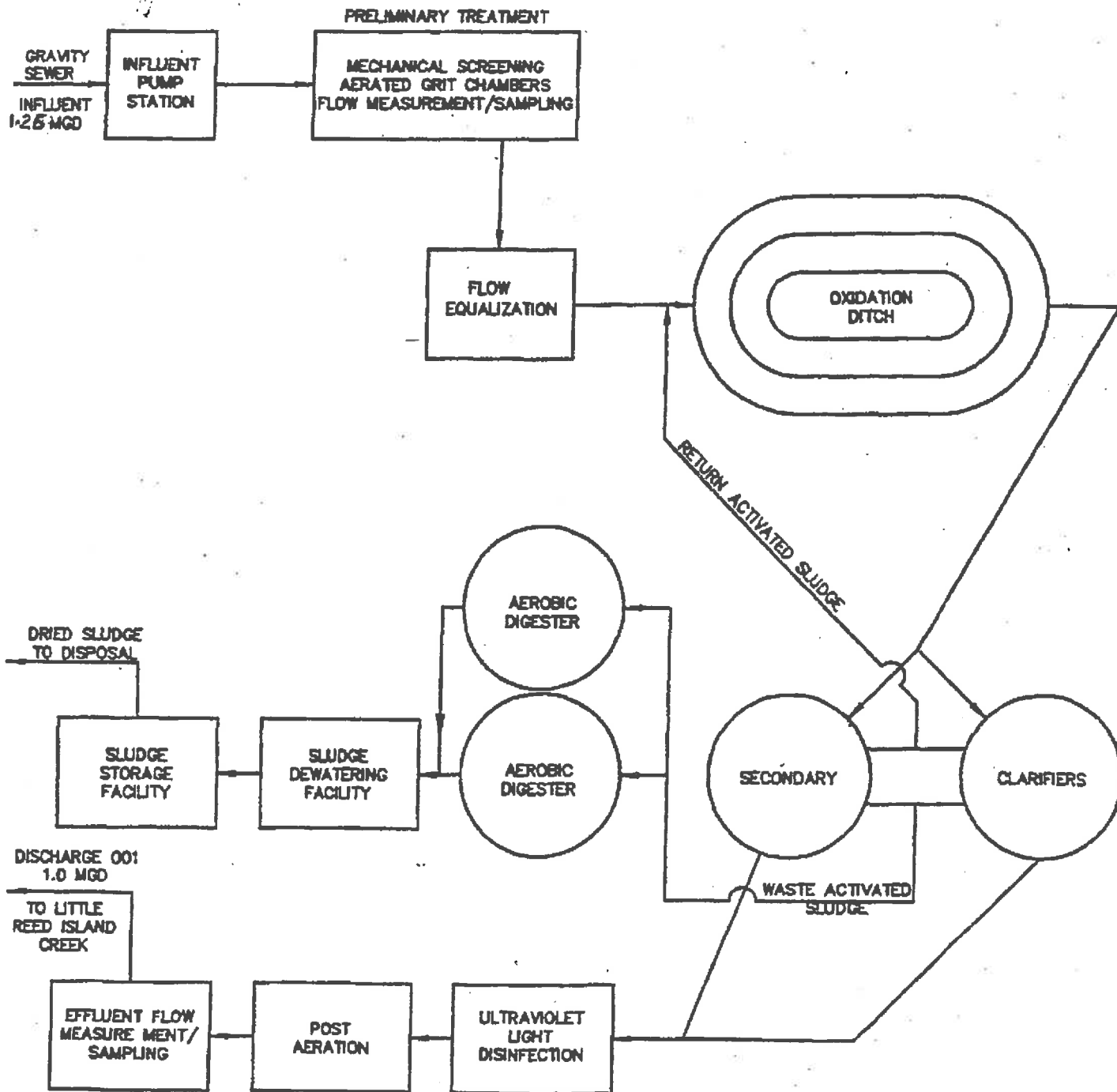
COUNTY: Carroll

[   ]   1.   The discharge is in conformance with the existing planning
documents for the area.

[   ]   2.   The discharge is not addressed in any planning document but
will be included, if required, when the plan is updated.

[   ]   3.   Other.

_____
TMDL Coordinator

_____
Date

ATTACHMENT 1

Treatment Process Diagrams & Description

PRELIMINARY TREATMENT

GRAVITY SEWER

INFLUENT 1.25 MGD

INFLUENT PUMP STATION

MECHANICAL SCREENING
AERATED GRIT CHAMBERS
FLOW MEASUREMENT/SAMPLING

FLOW EQUALIZATION

OXIDATION DITCH

RETURN ACTIVATED SLUDGE

DRIED SLUDGE TO DISPOSAL

AEROBIC DIGESTER

AEROBIC DIGESTER

SLUDGE STORAGE FACILITY

SLUDGE DEWATERING FACILITY

SECONDARY

CLARIFIERS

WASTE ACTIVATED SLUDGE

DISCHARGE 001 1.0 MGD

TO LITTLE REED ISLAND CREEK

EFFLUENT FLOW MEASURE MENT/ SAMPLING

POST AERATION

ULTRAVIOLET LIGHT DISINFECTION

SCHEMATIC OF WASTEWATER FLOW
TOWN OF HILLSVILLE WASTEWATER TREATMENT PLANT
HILLSVILLE, VIRGINIA
DISCHARGE SERIAL NO. 001

A.   Main Pump Station (Influent Pump Station)

   1.   Number of pumps - 2
   2.   Type of pumps - submersible
   3.   Capacity - 2200 gpm at 54 feet TDH (each)
   4.   Control - constant speed drive
   5.   Flow Measurement
        a.   Type - doppler ultrasonic (strapped to pump station force main)
        b.   Indicating/totalizing and recording capable at computer monitoring system located in the laboratory

B.   Bar Screen

   1.   Mechanical

        a.   Number - 1
        b.   Clear opening - 15 mm
        c.   Maximum capacity - 6.25 MGD

   2.   Manual (By-pass around mechanical screen)

        a.   Number - 1
        b.   Clear opening - 1.5 inches

C.   Aerated Grit Channels

   1.   Number of channels - 2
   2.   Mechanically cleaned
   3.   Basin volume - 3231 gallons (each)
   4.   Velocity control - aeration
        a.   Blower capacity - 110 cfm
        b.   Number of blowers - 2

D.   Flow Equalization

   1.   Number of basins - 2
   2.   Volume - 561,000 gallons in each basin at 15 feet maximum side water depth
   3.   Type - sideline
   4.   Type of aeration - submerged aspirator
        a.   Number of aspirators - 2 per basin
        b.   Oxygen transfer capacity/aspirator - 46.2 lbs./hour using 25 Hp motor
        c.   Effluent returned to Flow Equalization Pump Station
        d.   Overflow to treatment works by-pass parshall flume prior to entering treatment works discharge line

E.   Flow Equalization Pump Station

   1.   Number of pumps - 2
   2.   Type of pumps - submersible
   3.   Capacity - 870 gpm at 47 feet TDH (each)
   4.   Control - constant speed drive

F.   Oxidation Ditch

    1.   Number of channels – 3
    2.   Total basin volume – 1,508,611 gallons
    3.   Hydraulic detention time (at Q = 1.25 MGD) – 28.96 hours
    4.   Organic loading – 255.54 mg/l or 13.63 lbs./1000 ft^3
    5.   Type of aeration – surface mounted disc
        a.   Number of disc drives and Hp – Four at 30 Hp each and four
             at 40 Hp each
    6.   Alkalinity adjustment chemical Feed system
        a.   Type of chemical used – magnesium hydroxide
        b.   Chemical feed system
            a)   Positive displacement diaphragm metering pump
            b)   Number of pumps – 2
            c)   Capacity of pumps – 20 gph against 85 feet TDH

G.   Secondary Clarifiers

    1.   Number – 2
    2.   Shape – round (45 feet diameter/clarifier)
    3.   Volume – 19,880 ft^3 or 148,702 gallons (each clarifier)
    4.   Weir overflow rate – 4420.97 gpd/ft at Q = 1.25 MGD
    5.   Surface settling rate – 393 gpd/ft^2 at Q = 1.25 MGD
    6.   Hydraulic detention time – 5.71 hours at Q = 1.25 MGD
    7.   Scum collection/treatment – aerobic digester
    8.   Sludge pumping – Return Activated Sludge
        a.   Number of pumps – 2
        b.   Type of pump – submersible
        c.   Capacity – 870 gpm at 43 feet TDH
        d.   Control – variable frequency drive
        e.   Flow monitoring
            a)   Type – doppler ultrasonic (strap on type)
            b)   Indicating/totalizing and recording capable at
                 computer information system located in the laboratory

    9.   Sludge pumping – Waste Activated Sludge
        a.   Number of pumps – 2
        b.   Type of pump – submersible
        c.   Capacity – 100 gpm at 18 feet TDH
        d.   Control – constant speed drive
        e.   Flow monitoring
            a)   Type – doppler ultrasonic (strap on type)
            b)   Indicating/totalizing and recording capable at
                 computer information system located in the laboratory

H.   Ultraviolet Disinfection

    1.   Configuration – open channel
    2.   Number of channels – 2
    3.   Number of assemblies per channel – 2
    4.   Light chamber
        a.   Dimensions – 2.5 feet wide by 6 feet long by 0.63 feet
             maximum side water depth per lamp assembly. Total length of
             assemblies per channel is 12 feet.
        b.   Retention time – 7.49 seconds/unit or 14.98 seconds/channel
        c.   Design dosage – 190 microwatts/cm^2 at a distance of 1 meter
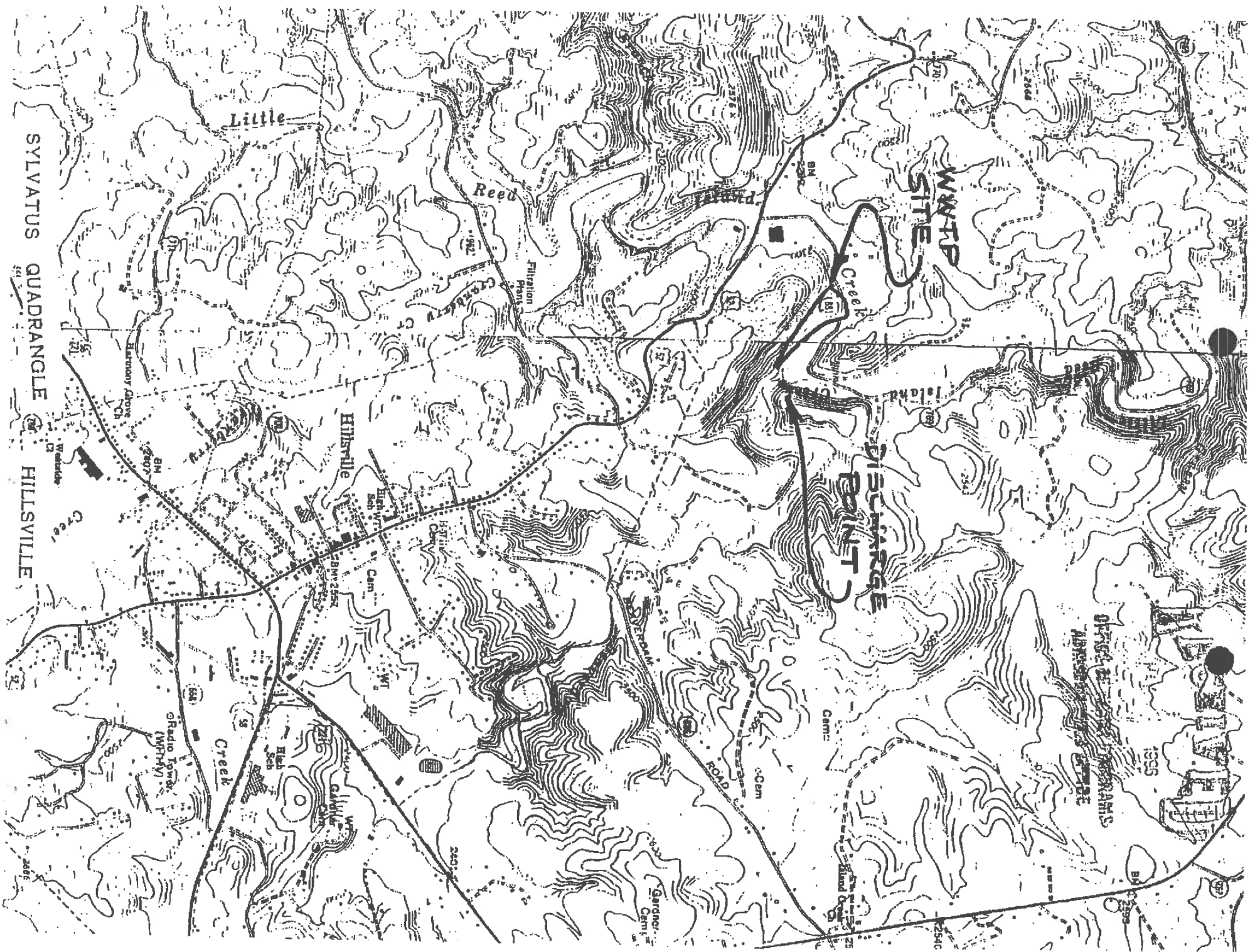
5.   Lamp/lamp assembly
    a.   Number of lamps/module - 6
    b.   Number of modules/assemblies - 8 (48 lamps/unit)
    c.   Lamp arc length - 147 cm
    d.   Lamp spacing - 2.5 inches on centers
    e.   Lamps per ballast - 2
    f.   Lamp assemblies arranged in series
    g.   UV intensity meter/channel - 1
    h.   Control box ventilation provided
    i.   Lamp monitoring system provided with light emitting diodes on control panel.

6.   Method of Routine Maintenance - manual cleaning

I.   Non-potable Water System

   1.   Source - Effluent from ultraviolet disinfection unit
   2.   Type of pump - Centrifugal
   3.   Number of pumps - 3
   4.   Pump Capacity - Two at 55 gpm against 143 feet TDH
                           One at 20 gpm against 99 feet TDH
   5.   Sodium hypochlorite metering pump and solution tank provide to control bacteriological regrowth in piping system.
    a.   Metering pump capacity - 12 gpd against 100 psi.

J.   Effluent Flow Measurement

   1.   Flow monitored - effluent from ultraviolet disinfection units
   2.   Type - parshall flume
   3.   Indicating/totalizing and recording capable at computer monitoring system located in the laboratory

K.   Post Aeration

   1.   Type - Cascade aeration
   2.   Number of steps - 7
   3.   Height of steps - 12-inches

L.   Bypass Flow Measurement

   1.   Flow monitored - overflow from flow equalization basins
   2.   Type - parshall flume
   3.   Indicating/totalizing and recording capable at computer monitoring system located in the laboratory

M.   Sludge Handling

   1.   Aerobic Digester
    a.   Sludge treated - WAS
    b.   Number of digesters - 2
    c.   Dimensions - 52 feet by 26 feet by 16.5 feet (each basin)
    d.   Volume - 166,863.84 gallons (each basin)
    e.   Retention Time - 40 days
    f.   Aeration

      a)   Type of aeration - submerged aspirator
      b)   Number of aspirators - 2 per digester
      c)   Oxygen transfer capacity/aspirator - 46.2 lbs./hour
            using 25 Hp motor

2.   Sludge Pumping - digested sludge to belt filter press
    a.   Number of pumps - 2
    b.   Type of pumps - progressive cavity
    c.   Capacity - 34 gpm at 10 feet TDH
    d.   Control - variable frequency drive

3.   Chemical Conditioning
    a.   Type of sludge conditioned - digested sludge
    b.   Type of chemical used - polymer
    c.   Chemical feed system
        a)   Type of feeder - positive displacement diaphragm
            metering pump
        b)   Number of feeders - 1
        c)   Maximum feed range - 2 gph

4.   Pressure Filtration
    a.   Type - belt filter press
    b.   Number of units - 1
    c.   Size of belt filter - 1.5 meters
    d.   Rated capacity - 350 lbs./hour minimum
    e.   Discharge cake (% solids) - 18% minimum

N.   Laboratory

1.   Floor Space - 608.7 ft^2
2.   Bench Space - 162 ft^2

O.   Alarms

1.   Functions monitored by remote terminal units (RTU)
    a.   Influent pump station
    b.   Mechanical bar screen
    c.   Grit channel blowers and pumps
    d.   Flow equalization basin pumps and aerators
    e.   Secondary clarifier high torque alarm
    f.   Return and Waste Activated sludge pumps
    g.   Aerobic digester aerators
    h.   Influent flow rate
    i.   Effluent flow rate
    j.   By-pass flow rate
    k.   Return and Waste Activated flow rate
    l.   Power failure

2.   Type of alarm - auto-dialer to 24-hour manned site and to computer located at the laboratory
3.   Battery backup power provided at each RTU

ATTACHMENT 2

Topographic Map

SYLVATUS QUADRANGLE

HILLSVILLE

Little

Reed

Island

WWTP
SITE

DISCHARGE
POINT

Hillsville

Creek

ATTACHMENT 3

Permit Limitations Development

MEMORANDUM

DEPARTMENT OF ENVIRONMENTAL QUALITY
Office of Water Quality Assessments
629 East Main Street   P.O. Box 10009   Richmond, Virginia 23219

SUBJECT: Flow Frequency Determination
                 Hillsville STP - VA#0089443

TO: Fred Wyatt, SWRO

FROM: Paul E. Herman, P.E., WQAP

DATE: August 3, 2001

COPIES: Durwood Willis, Jon VanSoestbergen, File

The Hillsville STP discharges to the Little Reed Island Creek near Hillsville, VA. Stream flow frequencies are required at this site for use by the permit writer in developing effluent limitations for the VPDES permit.

The USGS operated a continuous record gage on the Big Reed Island Creek near Allisonia, VA (#03167500) from 1909 to 1916 and from 1940 to 1995. The gage was located at the Route 693 bridge in Pulaski County, VA. The flow frequencies for the gage and the discharge point are presented below. The values at the discharge point were determined by drainage area proportions and do not address any withdrawals, discharges, or springs lying upstream.

Big Reed Island Creek near Allisonia, VA (#03167500):

Drainage Area = 278 mi^2

1Q10 = 89 cfs	High Flow 1Q10 = 111 cfs
7Q10 = 101 cfs	High Flow 7Q10 = 141 cfs
30Q5 = 143 cfs	HM = 281 cfs

Annual Average = 403 cfs

Little Reed Island Creek at discharge point:

Drainage Area = 41.48 mi^2

1Q10 = 13.3 cfs (8.58 mgd)	High Flow 1Q10 = 16.6 cfs (10.7 mgd)
7Q10 = 15.1 cfs (9.74 mgd)	High Flow 7Q10 = 21.0 cfs (13.6 mgd)
30Q5 = 21.3 cfs (13.8 mgd)	HM = 41.9 cfs (27.1 mgd)

Annual Average = 60.1 cfs (38.9 mgd)

The high flow months are January through May. If you have any questions concerning this analysis, please let me know.

0.9 MGD Water Treatment Plant withdrawal must be subtracted from these flows. Adjusted flows are:

1Q10 = 7.7 MGD   High Flow 1Q10 = 9.8 MGD
7Q10 = 8.8 MGD   High Flow 7Q10 = 12.7 MGD
30Q5 = 12.9 MGD   HM = 26.2 MGD

```
************************************************************************

     REGIONAL  MODELING  SYSTEM      VERSION  3.2
************************************************************************
MODEL SIMULATION FOR THE  Hillsville WWTP  DISCHARGE   DRY SEASON - JUNE - DEC

   TO  Little Reed Island Creek
----------------------------------------------------------------------
THE SIMULATION STARTS AT THE  Hillsville WWTP  DISCHARGE

*********************     PROPOSED PERMIT LIMITS     **********************

FLOW = 1.25 MGD    cBOD5 = 20 Mg/L    TKN = 7 Mg/L    D.O. = 7 Mg/L

****  THE MAXIMUM CHLORINE ALLOWABLE IN THE DISCHARGE IS  0.088 Mg/L  ****
         Alternate Disinfection Req.
----------------------------------------------------------------------
THE SECTION BEING MODELED IS 1 SEGMENT LONG
RESULTS WILL BE GIVEN AT 0.1 MILE INTERVALS


***********************     BACKGROUND CONDITIONS     *********************

THE 7Q10 STREAM FLOW AT THE DISCHARGE IS   8.74965 MGD
THE DISSOLVED OXYGEN OF THE STREAM IS  7.551 Mg/L
THE BACKGROUND cBODu OF THE STREAM IS  5 Mg/L
THE BACKGROUND nBOD OF THE STREAM IS  0 Mg/L


************************     MODEL PARAMETERS     *************************

 SEG.   LEN.    VEL.    K2      K1      KN    BENTHIC  ELEV.   TEMP.  DO-SAT
        Mi      F/S    1/D     1/D     1/D     Mg/L     Ft      °C     Mg/L
 -----  -----   -----  -----   -----   -----  -----   -----   -----  -----
   1    2.30    0.758  9.652   1.000   0.350  0.000  2218.50  20.00  8.390

(The K Rates shown are at 20°C ... the model corrects them for temperature.)
```

TOTAL STREAMFLOW =   9.9997 MGD
(Including Discharge)

DISTANCE FROM HEAD OF SEGMENT (MI.)	TOTAL DISTANCE FROM MODEL BEGINNING (MI.)	DISSOLVED OXYGEN (Mg/L)	cBODu (Mg/L)	nBODu (Mg/L)
0.000	0.000	7.482	10.625	2.165
0.100	0.100	7.462	10.540	2.159
0.200	0.200	7.445	10.455	2.153
0.300	0.300	7.429	10.371	2.147
0.400	0.400	7.415	10.288	2.141
0.500	0.500	7.403	10.205	2.135
0.600	0.600	7.392	10.123	2.129
0.700	0.700	7.383	10.042	2.123
0.800	0.800	7.375	9.962	2.117
0.900	0.900	7.368	9.882	2.111
1.000	1.000	7.363	9.802	2.105
1.100	1.100	7.358	9.723	2.099
1.200	1.200	7.355	9.645	2.093
1.300	1.300	7.352	9.568	2.087
1.400	1.400	7.350	9.491	2.081
1.500	1.500	7.349	9.415	2.075
1.600	1.600	7.349 ⟵ Sag	9.339	2.070
1.700	1.700	7.349	9.264	2.064
1.800	1.800	7.350	9.190	2.058
1.900	1.900	7.351	9.116	2.052
2.000	2.000	7.353	9.043	2.046
2.100	2.100	7.355	8.970	2.041
2.200	2.200	7.358	8.898	2.035
2.300	2.300	7.361	8.827	2.029

****

REGIONAL MODELING SYSTEM   Ver 3.2   (OWRM - 9/90)
04-12-1996   09:48:18

DATA FILE = NEWHILLS.MOD

D.O. Drop =   7.551
              7.349
              .202 Ok

```
*******************************************************************************
     REGIONAL  MODELING  SYSTEM     VERSION  3.2
*******************************************************************************
MODEL SIMULATION FOR THE  Hillsville WWTP   DISCHARGE
   TO  Little Reed Island Creek

SEASONAL LIMITS RUN  - -  WET SEASON PERIOD:  January  TO  May
-------------------------------------------------------------------------------

THE SIMULATION STARTS AT THE  Hillsville WWTP  DISCHARGE

************************  PROPOSED PERMIT LIMITS  *************************
FLOW =  1.25 MGD    cBOD5 =  25 Mg/L    TKN =  12 Mg/L    D.O. =  7 Mg/L
****   THE MAXIMUM CHLORINE ALLOWABLE IN THE DISCHARGE IS  0.118 Mg/L   ****
```
Alternate Disinfection Req.
```
-------------------------------------------------------------------------------
THE SECTION BEING MODELED IS 1 SEGMENT LONG
RESULTS WILL BE GIVEN AT 0.1 MILE INTERVALS

************************  BACKGROUND CONDITIONS  *************************
THE WET SEASON 7Q10 STREAM FLOW
   AT THE DISCHARGE IS  12.16207 MGD
THE DISSOLVED OXYGEN OF THE STREAM IS  9.361 Mg/L
THE BACKGROUND cBODu OF THE STREAM IS  5 Mg/L
THE BACKGROUND nBOD OF THE STREAM IS  0 Mg/L

************************  MODEL PARAMETERS  *************************
```

SEG.	LEN. Mi	VEL. F/S	K2 1/D	K1 1/D	KN 1/D	BENTHIC Mg/L	ELEV. Ft	TEMP. °C	DO-SAT Mg/L
1	2.30	0.903	9.652	1.000	0.000	0.000	2218.50	10.00	10.401

```
(The K Rates shown are at 20°C ... the model corrects them for temperature.)
```

TOTAL STREAMFLOW = 13.4121 MGD
(Including Discharge)

DISTANCE FROM HEAD OF SEGMENT (MI.)	TOTAL DISTANCE FROM MODEL BEGINNING (MI.)	DISSOLVED OXYGEN (Mg/L)	cBODu (Mg/L)	nBODu (Mg/L)
0.000	0.000	9.141	10.359	3.632
0.100	0.100	9.161	10.315	3.632
0.200	0.200	9.181	10.271	3.632
0.300	0.300	9.199	10.227	3.632
0.400	0.400	9.217	10.183	3.632
0.500	0.500	9.234	10.140	3.632
0.600	0.600	9.251	10.097	3.632
0.700	0.700	9.267	10.054	3.632
0.800	0.800	9.282	10.011	3.632
0.900	0.900	9.296	9.968	3.632
1.000	1.000	9.310	9.925	3.632
1.100	1.100	9.324	9.883	3.632
1.200	1.200	9.337	9.841	3.632
1.300	1.300	9.349	9.799	3.632
1.400	1.400	9.361	9.757	3.632
1.500	1.500	9.361	9.715	3.632
1.600	1.600	9.361	9.674	3.632
1.700	1.700	9.361	9.633	3.632
1.800	1.800	9.361	9.592	3.632
1.900	1.900	9.361	9.551	3.632
2.000	2.000	9.361	9.510	3.632
2.100	2.100	9.361	9.469	3.632
2.200	2.200	9.361	9.429	3.632
2.300	2.300	9.361	9.389	3.632

REGIONAL MODELING SYSTEM
04-10-1996   10,42.03   Ver 3.2   (OWRM - 9/90)

DATA FILE = NEWHILLS.MOD

```
*******************************************************************************
                REGIONAL MODELING SYSTEM            VERSION 3.2
                DATA  FILE  SUMMARY
*******************************************************************************

THE NAME OF THE DATA FILE IS: NEWHILLS.MOD


THE STREAM NAME IS:     Little Reed Island Creek
THE RIVER BASIN IS:     New River
THE SECTION NUMBER IS:  2
THE CLASSIFICATION IS:  VI

STANDARDS VIOLATED (Y/N)    = N
STANDARDS APPROPRIATE (Y/N) = Y

DISCHARGE WITHIN 3 MILES (Y/N) = N


THE DISCHARGE BEING MODELED IS: Hillsville WWTP

PROPOSED LIMITS ARE:
    FLOW  =   1.25  MGD
    BOD5  =   20    MG/L
    TKN   =   10    MG/L
    D.O.  =   7     MG/L

THE NUMBER OF SEGMENTS TO BE MODELED = 1

7Q10 WILL BE CALCULATED BY: DRAINAGE AREA COMPARISON
    THE GAUGE NAME IS: Big Reed Island Creek Near Allisonia
    GAUGE DRAINAGE AREA          =  278   SQ.MI.
    GAUGE 7Q10                   =  64.64 MGD
    DRAINAGE AREA AT DISCHARGE   =  37.63 SQ.MI.

STREAM A DRY DITCH AT DISCHARGE (Y/N) = N
ANTIDEGRADATION APPLIES (Y/N) = Y

ALLOCATION DESIGN TEMPERATURE =  20  °C
```

SEGMENT INFORMATION

#######   SEGMENT # 1   #######

SEGMENT ENDS BECAUSE: THE MODEL ENDS

SEGMENT LENGTH = 2.3 MI

SEGMENT WIDTH   = 19.5 FT
SEGMENT DEPTH   = .8 FT
SEGMENT VELOCITY = 1 FT/SEC

DRAINAGE AREA AT SEGMENT START = 37.63 SQ.MI.
DRAINAGE AREA AT SEGMENT END = 41.55 SQ.MI.

ELEVATION AT UPSTREAM END   = 2237 FT
ELEVATION AT DOWNSTREAM END = 2200 FT

THE CROSS SECTION IS: RECTANGULAR
THE CHANNEL IS: MODERATELY MEANDERING

POOLS AND RIFFLES (Y/N) = Y
    THE SEGMENT LENGTH IS 50 % POOLS
        POOL DEPTH = 1 FT
    THE SEGMENT LENGTH IS 50 % RIFFLES
      RIFFLE DEPTH = .6 FT

THE BOTTOM TYPE = SMALL ROCK
SLUDGE DEPOSITS = NONE
AQUATIC PLANTS = NONE
ALGAE OBSERVED = NONE
WATER COLORED GREEN (Y/N) = N

****

REGIONAL MODELING SYSTEM   Ver 3.2   (OWRM - 9/90)
04-10-1996   09:57:04

MIXING ANALYSIS FOR Hillsville WWTP
       Effluent flow   =   1.25   MGD
       Stream 7Q10 flow   =   8.8   MGD   Stream 1Q10 flow =   7.5   MGD
       Width   =   19.5   ft   Slope (ft/ft)   =   .00305
       Bottom scale   =   4
       Channel has normal irregularities

C H R O N I C   R E S U L T S
       7Q10 depth   =   1.26 ft
       7Q10 velocity   =   0.63 ft/sec =   10.3 mi / day
       Mixing length @ 7Q10 =   217 ft =
       Residence time   =   0.004 days
     COMPLETE MIX MAY BE USED FOR THE CHRONIC WLA
       Percent of 7Q10 to be used for WLAc = 100%

A C U T E   R E S U L T S
       1Q10 depth   =   1.16 ft
       1Q10 velocity   =   0.60 ft/sec =   9.8 mi / day
       Mixing length @ 1Q10 =   235 ft =
       Residence time   =   0.108 hours
     COMPLETE MIX MAY BE USED FOR THE ACUTE WLA
       Percent of 1Q10 to be used for WLAa = 100%

C:\WLA>   Use print screen for hard copy

Calculation of Total Ammonia Nitrogen Limits

Facility Name: Hillsville WWTP
VPDES Permit No: VA0089443

NH_3-N limits are derived from the ammonia tables or formulas in the <u>Water Quality Standards</u>. Human Health standards are not applicable for ammonia.

Based on Tables 1B & 2B of the <u>Water Quality Standards</u>, Total Ammonia standards were calculated for a Summer Tier and a Winter Tier.

Summer pH = 7.0	Dry Season Temperature = 20° C
Winter pH = 7.0	Wet Season Temperature = 10° C

pH values are based on actual stream data.

The calculated ammonia nitrogen water quality standards (WQS) are:

$$\text{Acute } Ao_d = WQS_{dry} = (23 \times 0.822)\,mg/l = 18.9\ mg/l$$
$$\text{Acute } Ao_w = WQS_{wet} = (25 \times 0.822)\,mg/l = 20.6\ mg/l$$

$$\text{Chronic } Co_d = WQS_{dry} = (1.79 \times 0.822)\,mg/l = 1.47\ mg/l$$
$$\text{Chronic } Co_w = WQS_{wet} = (2.66 \times 0.822)\,mg/l = 2.19\ mg/l$$

Q_e = Design Flow of STP(MGD) = 1.25

Q_s = Critical Flow (1Q10 for Acute, 7Q10 for Chronic)

Q_{s-1} = 1Q10 Flow (MGD) = 7.5
Q_{s-1w} = 1Q10 High Flow (MGD) = 10.8
Q_{s-7} = 7Q10 Flow (MGD) = 8.8
Q_{s-7w} = 7Q10 High Flow (MGD) = 12.67

The antidegredation baseline is calculated as follows (for new or expanding discharges):

Acute Baseline (dry) = AB_d = .25(Ao_d - background) + background)

AB_d = [.25(18.9 - 0) + 0] mg/l

AB_d = 4.73 mg/l

Acute Baseline (wet) = AB_w = .25(Ao_w - background) + background)

AB_w = [.25(20.6 - 0) + 0] mg/l

AB_w = 5.15 mg/l

Chronic Baseline (dry) = CB_d = .25(Co_d - background) + background)

CB_d = [.25(1.47 - 0) + 0] mg/l

CB_d = 0.37 mg/l

Chronic Baseline (wet) = CB_w = .25(Co_w - background) + background)

CB_w = [.25(2.19 - 0) + 0] mg/l

CB_w = 0.55 mg/l

The antidegredation wasteload allocations (AWLAs) are calculated as follows, assuming a background concentration of 0:

$AWLA_{ad}$ = acute dry AWAL = $\dfrac{[AB_d (Qs\text{-}1_{dry} + Qe) - Qs\text{-}1_{dry}(background)]}{Qe}$

$AWLA_{ad}$ = [(4.73(7.5 + 1.25) - 0]/1.25

$AWLA_{ad}$ = 33.1 mg/l

$AWLA_{aw}$ = acute wet AWAL = $\dfrac{[AB_w (Qs\text{-}1_{wet} + Qe) - Qs\text{-}1_{wet}(background)]}{Qe}$

$AWLA_{aw}$ = [(5.15)(10.8 + 1.25) - 0]/1.25

$AWLA_{aw}$ = 49.6 mg/l

$AWLA_{cd}$ = chronic dry AWAL = $\dfrac{[CB_d (Qs\text{-}7_{dry} + Qe) - Qs\text{-}7_{dry}(background)]}{Qe}$

$AWLA_{cd}$ = [(0.37)(8.8 + 1.25) - 0]/1.25

$AWLA_{cd}$ = 2.97 mg/l

$AWLA_{cw}$ = chronic wet AWAL = $\dfrac{[CB_w (Qs\text{-}7_{wet} + Qe) - Qs\text{-}7_{wet}(background)]}{Qe}$

$AWLA_{cw}$ = [(0.55)(12.67 + 1.25) - 0]/1.25

$AWLA_{cw}$ = 6.12 mg/l

Analysis of the Hillsville\Carroll Co. WWTP effluent data for Ammonia Nitrogen

The statistics for Ammonia Nitrogen are:
```
     Number of values            =  1
     Quantification level        =  .2
     Number < quantification     =  0
     Expected value              =  9
     Variance                    =  29.16001
     C.V.                        =  .6
     97th percentile             =  21.90076
     Statistics used             =  Reasonable potential assumptions - Type 2 data
```

The WLAs for Ammonia Nitrogen are:
```
     Acute WLA          =  33.1
     Chronic WLA        =  2.97
     Human Health WLA   =  ----
```

The limits are based on chronic toxicity and 1 samples/month.

```
     Maximum daily limit   =  4.343847    Dry Season
     Average monthly limit =  4.343847
```

It is recommended that only the maximum daily limit be used.

DATA
9

Analysis of the Hillsville\Carroll Co. WWTP effluent data for Ammonia Nitrogen

The statistics for Ammonia Nitrogen are:
```
     Number of values            =  1
     Quantification level        =  .2
     Number < quantification     =  0
     Expected value              =  9
     Variance                    =  29.16001
     C.V.                        =  .6
     97th percentile             =  21.90076
     Statistics used             =  Reasonable potential assumptions - Type 2 data
```

The WLAs for Ammonia Nitrogen are:
```
     Acute WLA          =  49.6
     Chronic WLA        =  6.12
     Human Health WLA   =  ----
```

The limits are based on chronic toxicity and 1 samples/month.

```
     Maximum daily limit   =  8.950958    Wet Season
     Average monthly limit =  8.950958
```

It is recommended that only the maximum daily limit be used.

DATA
9

ATTACHMENT 4
Whole Effluent Toxicity Analysis

WET Summary Test Results
Town of Hillsville WWTP
VA0089443
01/15/2012 - 01/14/2017 Report Due by October 10th each year
NOEC Criteria is 9% or TU_c 11.1

TEST DATE		TEST TYPE/ORGANISM	LC_{50} %	NOEC %	% Survival	NOTES	Lab
08/13/12-08/19/12 Received 09/10/12	AN-1	Chronic *C. dubia*	NA	100% S&R	100%	Pass	BMI
08/14/12-08/21/12 Received 09/10/12		Chronic *P. promelas*	NA	54.5% S 100% G	85%	Pass	BMI
06/18/13-06/24/13 Received 12/16/13	AN-2	Chronic *C. dubia*	NA	100% S&R	100%	Pass	BMI
06/18/13-06/25/13 Received 12/16/13		Chronic *P. promelas*	NA	100% S&G	100%	Pass	BMI
06/24/14-06/30/14 Received 08/07/14	AN-3	Chronic *C. dubia*	NA	100% S&R	100%	Pass	BMI
06/24/14-07/01/14 Received 08/07/14		Chronic *P. promelas*	NA	100% S&G	100%	Pass	BMI
06/09/15-06/15/15 Received 07/10/15	AN-4	Chronic *C. dubia*	NA	100% S&R	100%	Pass	BMI
06/09/15-06/16/15 Received 07/10/15		Chronic *P. promelas*	NA	100% S&G	100%	Pass	BMI
04/19/16-04/26/16 Received 06/09/16	AN-5	Chronic *C. dubia*	NA	100% S&R	100%	Pass	BMI
04/19/16-04/26/16 Received 06/09/16		Chronic *P. promelas*	NA	100% S&G	100%	Pass	BMI

% Survival is the percent survival in 100% effluent at the end of the test period.

Test Results for Outfall 001 (all samples are 24 hour flow proportional composites)

ABBREVIATIONS: AN - Annual test
                      BMI - Biological Monitoring, Inc.

Dilutions established; 0%, 2.25%, 4.5%, 9%, 54.5% and 100%.

Spreadsheet for determination of WET test endpoints or WET limits

Excel 97		**Acute Endpoint/Permit Limit**	**Use as LC₅₀ In Special Condition, as TUa on DMR**

<table>
<tr><td>Excel 97</td><td></td><td colspan="2">Acute Endpoint/Permit Limit</td><td colspan="4">Use as LC₅₀ In Special Condition, as TUa on DMR</td></tr>
</table>

Excel 97
Revision Date: 12/13/13
File: WETLIM10.xls
(MIX.EXE required also)

Acute Endpoint/Permit Limit — **Use as LC_{50} In Special Condition, as TUa on DMR**

ACUTE	1.17591005 TUa	LC_{50} =	85	% Use as	1.18	TUa

ACUTE WLAa	2.148	Note: Inform the permittee that if the mean of the data exceeds
		this TUa: 1.0 a limit may result using STATS.EXE

Chronic Endpoint/Permit Limit — **Use as NOEC In Special Condition, as TUc on DMR**

CHRONIC	11.7591005 TUc	NOEC =	9	% Use as	11.11	TUc
BOTH*	21.4800005 TUc	NOEC =	5	% Use as	20.00	TUc
AML	11.7591005 TUc	NOEC =	9	% Use as	11.11	TUc

Enter data in the cells with blue type:

ACUTE WLAa,c	21.48	Note: Inform the permittee that if the mean
CHRONIC WLAc	8.04	of the data exceeds this TUc: 4.83233967
* Both means acute expressed as chronic		a limit may result using STATS.EXE

Entry Date:	08/08/16
Facility Name:	Hillsville WWTP
VPDES Number:	VA0092916
Outfall Number:	1

Plant Flow:	1.25 MGD	**% Flow to be used from MIX.EXE**		**Diffuser /modeling study?**	
Acute 1Q10:	7.7 MGD	100 %		Enter Y/N	n
Chronic 7Q10:	8.8 MGD	100 %		Acute	1 :1
				Chronic	1 :1

Are data available to calculate CV? (Y/N)	N	(Minimum of 10 data points, same species, needed)	Go to Page 2
Are data available to calculate ACR? (Y/N)	N	(NOEC<LC50, do not use greater/less than data)	Go to Page 3

IWCₐ	13.96648045 %	Plant flow/plant flow + 1Q10	NOTE: If the IWCa is >33%, specify the
IWCc	12.43781095 %	Plant flow/plant flow + 7Q10	NOAEC = 100% test/endpoint for use

Dilution, acute	7.16	100/IWCa
Dilution, chronic	8.04	100/IWCc

WLAₐ	2.148	Instream criterion (0.3 TUa) X's Dilution, acute
WLAc	8.04	Instream criterion (1.0 TUc) X's Dilution, chronic
WLAa,c	21.48	ACR X's WLAₐ - converts acute WLA to chronic units

ACR -acute/chronic ratio	10	LC50/NOEC (Default is 10 - if data are available, use tables Page 3)
CV-Coefficient of variation	0.6	Default of 0.6 - if data are available, use tables Page 2)
Constants	eA	0.4109447	Default = 0.41
	eB	0.6010373	Default = 0.60
	eC	2.4334175	Default = 2.43
	eD	2.4334175	Default = 2.43 (1 samp) No. of sample 1

**The Maximum Daily Limit is calculated from the lowest
LTA, X's eC. The LTAa,c and MDL using it are driven by the ACR.

LTAₐ,c	8.827092156	WLAa,c X's eA
LTAc	4.832339892	WLAc X's eB

MDL** with LTAₐ,c	21.48000053 TUc	NOEC =	4.655493	(Protects from acute/chronic toxicity)
MDL** with LTAc	11.75910046 TUc	NOEC =	8.504052	(Protects from chronic toxicity)
AML with lowest LTA	11.75910046 TUc	NOEC =	8.504052	Lowest LTA X's eD

Rounded NOEC's		%
NOEC =	5	%
NOEC =	9	%
NOEC =	9	

IF ONLY ACUTE ENDPOINT/LIMIT IS NEEDED, CONVERT MDL FROM TUc to TUₐ

MDL with LTAₐ,c	2.148000053 TUₐ	LC50 =	46.554934 %
MDL with LTAc	1.175910046 TUₐ	LC50 =	85.040518 %

Rounded LC50's		%
LC50 =	47	%
LC50 =	86	

Page 2 - Follow the directions to develop a site specific CV (coefficient of variation)

			Vertebrate IC_{25} Data or LC_{50} Data ***********	LN of data		Invertebrate IC_{25} Data or LC_{50} Data ***********	LN of data
		1			1		
		2			2		
		3			3		
		4			4		
		5			5		
		6			6		
Coefficient of Variation for effluent tests		7			7		
		8			8		
		9			9		
$CV =$	0.6 (Default 0.6)	10			10		
		11			11		
$\delta^2 =$	0.3074847	12			12		
$\delta =$	0.554513029	13			13		
		14			14		
Using the log variance to develop eA		15			15		
(P. 100, step 2a of TSD)		16			16		
$Z = 1.881$ (97% probability stat from table		17			17		
$A =$	-0.88929666	18			18		
$eA =$	0.410944686	19			19		
		20			20		
Using the log variance to develop eB							
(P. 100, step 2b of TSD)		St Dev	NEED DATA	NEED DATA	St Dev	NEED DATA	NEED DATA
$\delta_4^2 =$	0.086177696	Mean	0	0	Mean	0	0
$\delta_4 =$	0.293560379	Variance	0	0.000000	Variance	0	0.000000
$B =$	-0.50909823	CV	0		CV	0	
$eB =$	0.601037335						
Using the log variance to develop eC							
(P. 100, step 4a of TSD)							
$\delta^2 =$	0.3074847						
$\delta =$	0.554513029						
$C =$	0.889296658						
$eC =$	2.433417525						
Using the log variance to develop eD							
(P. 100, step 4b of TSD)							
$n =$	1	This number will most likely stay as "1", for 1 sample/month.					
$\delta_n^2 =$	0.3074847						
$\delta_n =$	0.554513029						
$D =$	0.889296658						
$eD =$	2.433417525						

Page 3 - Follow directions to develop a site specific ACR (Acute to Chronic Ratio)

To determine Acute/Chronic Ratio (ACR), insert usable data below. Usable data is defined as valid paired test results, acute and chronic, tested at the same temperature, same species. The chronic NOEC must be less than the acute LC_{50}, since the ACR divides the LC_{50} by the NOEC. LC_{50}'s >100% should not be used.

Table 1. ACR using Vertebrate data

Set #	LC_{50}	NOEC	Test ACR	Logarithm	Geomean	Antilog	ACR to Use
1	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	NO DATA
2	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	NO DATA
3	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	NO DATA
4	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	NO DATA
5	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	NO DATA
6	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	NO DATA
7	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	NO DATA
8	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	NO DATA
9	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	NO DATA
10	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	NO DATA

ACR for vertebrate data: 0

Table 1. Result:	Vertebrate ACR	0
Table 2. Result:	Invertebrate ACR	0
	Lowest ACR	Default to 10

Table 2. ACR using Invertebrate data

Set #	LC_{50}	NOEC	Test ACR	Logarithm	Geomean	Antilog	ACR to Use
1	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	NO DATA
2	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	NO DATA
3	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	NO DATA
4	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	NO DATA
5	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	NO DATA
6	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	NO DATA
7	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	NO DATA
8	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	NO DATA
9	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	NO DATA
10	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	NO DATA

ACR for vertebrate data: 0

Convert LC_{50}'s and NOEC's to Chronic TU's for use in WLA.EXE

Table 3.		ACR used:	10	
	Enter LC_{50}	TUc	Enter NOEC	TUc
1		NO DATA		NO DATA
2		NO DATA		NO DATA
3		NO DATA		NO DATA
4		NO DATA		NO DATA
5		NO DATA		NO DATA
6		NO DATA		NO DATA
7		NO DATA		NO DATA
8		NO DATA		NO DATA
9		NO DATA		NO DATA
10		NO DATA		NO DATA
11		NO DATA		NO DATA
12		NO DATA		NO DATA
13		NO DATA		NO DATA
14		NO DATA		NO DATA
15		NO DATA		NO DATA
16		NO DATA		NO DATA
17		NO DATA		NO DATA
18		NO DATA		NO DATA
19		NO DATA		NO DATA
20		NO DATA		NO DATA

If WLA.EXE determines that an acute limit is needed, you need to convert the TUc answer you get to TUa and then an LC50, enter it here:

	NO DATA	%LC_{50}
	NO DATA	TUa

DILUTION SERIES TO RECOMMEND

Table 4.		Monitoring		Limit	
		% Effluent	TUc	% Effluent	TUc
Dilution series based on data mean		20.7	4.83234		
Dilution series to use for limit				9	11.111111
Dilution factor to recommend:		0.4549056		0.3	
Dilution series to recommend:		100.0	1.00	100.0	1.00
		45.5	2.20	30.0	3.33
		20.7	4.83	9.0	11.11
		9.4	10.62	2.7	37.04
		4.28	23.35	0.8	123.46
Extra dilutions if needed		1.95	51.33	0.2	411.52
		0.89	112.84	0.1	1371.74

Cell: I9

Comment:

This is assuming that the data are Type 2 data (none of the data in the data set are censored - "<" or ">").

Cell: K18

Comment: This is assuming that the data are Type 2 data (none of the data in the data set are censored - "<" or ">").

Cell: J22

Comment: Remember to change the "N" to "Y" if you have ratios entered, otherwise, they won't be used in the calculations.

Cell: C40

Comment:

If you have entered data to calculate an ACR on page 3, and this is still defaulted to "10", make sure you have selected "Y" in cell E21

Cell: C41

Comment: If you have entered data to calculate an effluent specific CV on page 2, and this is still defaulted to "0.6", make sure you have selected "Y" in cell E20

Cell: L48

Comment:

See Row 151 for the appropriate dilution series to use for these NOEC's

Cell: G62

Comment:

Vertebrates are:
Pimephales promelas
Oncorhynchus mykiss
Cyprinodon variegatus

Cell: J62

Comment:

Invertebrates are:
Ceriodaphnia dubia
Mysidopsis bahia

Cell: C117

Comment: Vertebrates are:

Pimephales promelas
Cyprinodon variegatus

Cell: M119

Comment: The ACR has been picked up from cell C34 on Page 1. If you have paired data to calculate an ACR, enter it in the tables to the left, and make sure you have a "Y" in cell E21 on Page 1. Otherwise, the default of 10 will be used to convert your acute data.

Cell: M121

Comment: If you are only concerned with acute data, you can enter it in the NOEC column for conversion and the number calculated will be equivalent to the TUa. The calculation is the same: 100/NOEC = TUc or 100/LC50 = TUa.

Cell: C138

Comment: Invertebrates are:

Ceriodaphnia dubia
Mysidopsis bahia

ATTACHMENT 5

Metals Specific Target Values for Water Quality Criteria Monitoring

		HARDNESS	
ACUTE			50.00
	COPPER ug/l	WQSACUTE	
CHRONIC			7.0
		WQSCHRONIC	
			5.0

		HARDNESS	
ACUTE			50.00
	LEAD ug/l	WQSACUTE	
CHRONIC			49.21
		WQSCHRONIC	
			5.59

		HARDNESS	
ACUTE			50.00
	ZINC ug/l	WQSACUTE	
CHRONIC			66.60
		WQSCHRONIC	
			66.60

		HARDNESS	
ACUTE			50.00
	CADMIUM ug/l	WQSACUTE	
CHRONIC			1.79
		WQSCHRONIC	
			0.66

		HARDNESS	
ACUTE			50.00
	CHROMIUM III ug/l	WQSACUTE	
CHRONIC			322.96
		WQSCHRONIC	
			42.01

		HARDNESS	
ACUTE			50.00
	NICKEL ug/l	WQSACUTE	
CHRONIC			101.45
		WQSCHRONIC	
			11.27

		HARDNESS	
ACUTE			50.00
	SIVER ug/l	WQSACUTE	
			1.05

Hillsville WWTP
Metals Calculations

WLA formula = chronic standard (7Q10 + effluent flow / effluent flow

Antimony: WLA = 640 (8.8 + 1.25)/1.25 ug/l = ~~5146~~ 1000 ug/l

Arsenic: WLA = 150 (8.8 + 1.25)/1.25 ug/l = ~~1206~~ 1000 ug/l

Cadmium: WLA = 0.66 (8.8 + 1.25)/1.25 ug/l = 5.3 ug/l

Chromium III: WLA = 42.01 (8.8 + 1.25)/1.25 ug/l = ~~338~~ 300 ug/l

Chromium VI: WLA = 11 (8.8 + 1.25)/1.25 ug/l = 88 ug/l

Copper: WLA = 5.0 (8.8 + 1.25)/1.25 ug/l = 40 ug/l

Lead: WLA = 5.59 (8.8 + 1.25)/1.25 ug/l = 45 ug/l

Mercury: WLA = 0.77 (8.8 + 1.25)/1.25 ug/l = 6.2 ug/l

Selenium: WLA = 5.0 (8.8 + 1.25)/1.25 ug/l = 40 ug/l

Silver: WLA = 1.05 (7.7 1Q10 + 1.25)/1.25 ug/l = 7.5 ug/l

Zinc: WLA = 66.6 (8.8 + 1.25)/1.25 ug/l = ~~535~~ 500 ug/l

Nickel: WLA = 11.27 (8.8 + 1.25)/1.25 ug/l = 91 ug/l

ATTACHMENT 6

303 (d) Fact Sheets

TMDL

Cause Group Code: N15R-01-TEMP   Little Reed Island Creek

Location: This segment begins approximately 1 mile below the Hillsville water intake and continues downstream to the Big Reed Island Creek confluence.

City / County: Carroll Co.   Pulaski Co.   Wythe Co.

Use(s): Aquatic Life

Cause(s) /
VA Category: Temperature, water/ 5A

AWQM station station 9-LRI017.64 had a 25% exceedance of the temperature standard.

Assessment Unit / Water Name / Description	Cause Category / Name	Nested	Cycle First Listed	TMDL Schedule or EPA Approval	Size
VAS-N15R_LRI02A08 / Little Reed Island Creek / Segment extends from Rock Creek confluence upstream to Hillsville PWS intake, WQS Section 2.	5A Temperature, water		2008	2020	19.70

Little Reed Island Creek	Estuary (Sq. Miles)	Reservoir (Acres)	River (Miles)
Aquatic Life			
Temperature, water - Total Impaired Size by Water Type:			**19.70**

Sources:

Source Unknown

Loss of Riparian Zone

Cause Group Code: N15R-01-BAC   **Little Reed Island Creek**

Location: This segment begins 5 miles above the Hillsville public water intake and extends downstream to the confluence with Big Reed Island Creek.

City / County: Carroll Co.   Pulaski Co.   Wythe Co.

Use(s): Recreation

Cause(s) /
VA Category: Escherichia coli/ 5A

AWQM station 9-LRI001.62 had a 44% exceedance of the E.coli water quality standard, station 9-LRI009.11 had a 22% exceedance, station 9-LRI017.64 had a 41% exceedance, station 9-LRI023.48 had a 50% exceedance, and station 9-LRI031.58 had a 33% exceedance of the E. coli water quality standard.

Assessment Unit / Water Name / Description	Cause Category / Name		Nested	Cycle First Listed	TMDL Schedule or EPA Approval	Size
VAS-N15R_LRI01A98 / Little Reed Island Creek / Little Reed Island Creek mainstem from confluence with Big Reed Island Ck upstream to Rock Ck, WQS Section 2.	5A	Escherichia coli		2008	2020	11.00
VAS-N15R_LRI01B98 / East Fork Little Reed Island Creek / From Hillsville PWS intake, upstream five miles, WQS Section 2f.	5A	Escherichia coli		2008	2020	5.28
VAS-N15R_LRI02A08 / Little Reed Island Creek / Segment extends from Rock Creek confluence upstream to Hillsville PWS intake, WQS Section 2.	5A	Escherichia coli		2008	2020	19.70

Little Reed Island Creek **Recreation**	Estuary (Sq. Miles)	Reservoir (Acres)	River (Miles)
Escherichia coli - Total Impaired Size by Water Type:			**35.98**

Sources:

Livestock (Grazing or Feeding Operations)

On-site Treatment Systems (Septic Systems and Similar Decentralized Systems)

Source Unknown

Unspecified Domestic Waste

~~Wildlife Other than Waterfowl~~

ATTACHMENT 7

T & E Species

VaFWIS Initial Project Assessment Report Compiled on 8/2/2016, 11:55:14 AM

Known or likely to occur within a **2 mile radius around point 36,47,13.0 80,44,52.0**
in **035 Carroll County, VA**

**View Map of
Site Location**

418 Known or Likely Species ordered by Status Concern for Conservation
(displaying first 23) (23 species with Status* or Tier I** or Tier II**)

BOVA Code	Status*	Tier**	Common Name	Scientific Name	Confirmed	Database(s)
030061	FTSE	Ia	Turtle, bog (= Muhlenberg)	Clemmys muhlenbergii		BOVA,Habitat
050022	FTST	Ia	Bat, northern long-eared	Myotis septentrionalis		BOVA
070118	FTSE	Ic	Crayfish, Big Sandy	Cambarus callainus		BOVA
050020	SE	Ia	Bat, little brown	Myotis lucifugus lucifugus		BOVA
050027	SE	Ia	Bat, tri-colored	Perimyotis subflavus		BOVA
040096	ST	Ia	Falcon, peregrine	Falco peregrinus		BOVA
040293	ST	Ia	Shrike, loggerhead	Lanius ludovicianus		BOVA
060081	ST	IIa	Floater, green	Lasmigona subviridis		BOVA,Habitat
060140	ST	IIIb	Pistolgrip	Tritogonia verrucosa		BOVA
040292	ST		Shrike, migrant loggerhead	Lanius ludovicianus migrans		BOVA
100248	FS	Ia	Fritillary, regal	Speyeria idalia idalia		BOVA
040093	FS		Eagle, bald	Haliaeetus leucocephalus		BOVA
020020	CC	Ia	Hellbender, eastern	Cryptobranchus alleganiensis alleganiensis		BOVA
010199	CC	Ib	Darter, candy	Etheostoma osburni		BOVA
030012	CC	IVa	Rattlesnake, timber	Crotalus horridus		BOVA
040306		Ia	Warbler, golden-winged	Vermivora chrysoptera		BOVA
050024		Ia	Myotis, eastern small-footed	Myotis leibii		BOVA
040052		IIa	Duck, American black	Anas rubripes		BOVA
040320		IIa	Warbler, cerulean	Setophaga cerulea		BOVA
040140		IIa	Woodcock, American	Scolopax minor		BOVA
040203		IIb	Cuckoo, black-billed	Coccyzus erythropthalmus		BOVA
040304		IIc	Warbler, Swainson's	Limnothlypis swainsonii		BOVA
080003		IIc	Snaketail, pygmy	Ophiogomphus howei		BOVA

To view **All 418 species** View 418

*FE=Federal Endangered;   FT=Federal Threatened;   SE=State Endangered;   ST=State Threatened;   FC=Federal Candidate;   FS=Federal Species of Concern;
CC=Collection Concern

**I=VA Wildlife Action Plan - Tier I - Critical Conservation Need;   II=VA Wildlife Action Plan - Tier II - Very High Conservation Need;   III=VA Wildlife Action Plan -
Tier III - High Conservation Need;   IV=VA Wildlife Action Plan - Tier IV - Moderate Conservation Need
Virginia Widlife Action Plan Conservation Opportunity Ranking:
a - On the ground management strategies/actions exist and can be feasibly implemented.;   b -
On the ground actions or research needs have been identified but cannot feasibly be implemented at this time.;   c -
No on the ground actions or research needs have been identified or all identified conservation opportunities have been exhausted.

Bat Colonies or Hibernacula: Not Known

Anadromous Fish Use Streams

N/A

Colonial Water Bird Survey

N/A

Threatened and Endangered Waters

N/A

Managed Trout Streams (2 records) (Click on Stream Name to view complete reach history)   <u>View Map of All</u> <u>Trout Stream Surveys</u>

Reach ID	Stream Name	Class	Brook Trout	Brown Trout	Rainbow Trout	View Map
04LRD-01	Little Reed Island Creek	Stockable	Y			Yes
04TRT-01	Trout Branch	Wild trout	Y			Yes

Bald Eagle Concentration Areas and Roosts

N/A

Bald Eagle Nests

N/A

Habitat Predicted for Aquatic WAP Tier I & II Species   (1 Reach)   <u>View Map Combined Reaches from Below of</u> <u>Habitat Predicted for WAP Tier I & II Aquatic</u> <u>Species</u>

Stream Name	Tier Species				View Map
	Highest TE*	BOVA Code, Status*, Tier**, Common & Scientific Name			
Little Reed Island Creek (50500011)	ST	060081	ST	IIa	Floater, green	Lasmigona subviridis	Yes

Habitat Predicted for Terrestrial WAP Tier I & II Species

BOVA Code	Status*	Tier**	Common Name	Scientific Name	View Map
030061	FTSE	Ia	Turtle, bog (= Muhlenberg)	Clemmys muhlenbergii	Yes

Public Holdings:

N/A

Tier Reaches Group Little Reed Island Creek (50500011)

36,47,13.0 -80,44,52.0 is the Search Point

Display	Item Location is not
at center	at map center

Show Position Rings
◉ Yes ○ No
1 mile and 1/4 mile at the **Search Point**

Show Search Area
◉ Yes ○ No
2 Search distance miles radius

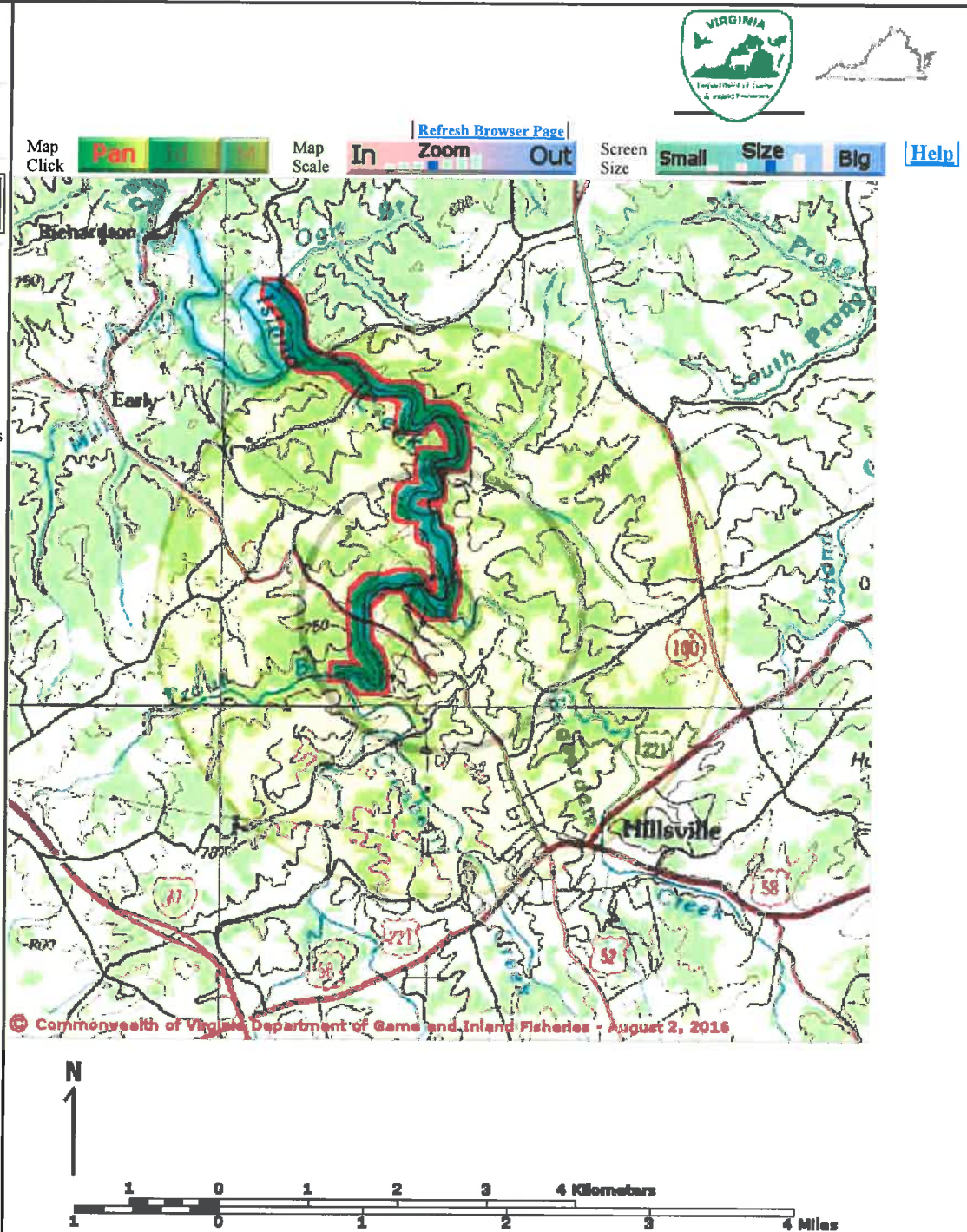**Search Point** is at map center

Base Map Choices
Topography ⌄

Map Overlay Choices
Current List: Position, Search, Observation

Map Overlay Legend

Position Rings 1 mile and 1/4 mile at the Search Point

2 mile radius Search Area

Data Observation Site

Map Click | Pan | | | Map Scale | In | Zoom | Out | Screen Size | Small | Size | Big | Help

Refresh Browser Page

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N

1 0 1 2 3 4 Kilometers
1 0 1 2 3 4 Miles

Point of Search 36,47,13.0 -80,44,52.0
Map Location   36,47,13.0 -80,44,52.0

Select **Coordinate System:** ◉ Degrees,Minutes,Seconds Latitude - Longitude
○ Decimal Degrees Latitude - Longitude
○ Meters UTM NAD83 East North Zone
○ Meters UTM NAD27 East North Zone

Base Map source: USGS 1:100,000 topographic maps (see Microsoft terraserver-usa.com for details)

Map projection is UTM Zone 17 NAD 1983 with left 517704 and top 4076068. Pixel size is 16 meters . Coordinates displayed are Degrees, Minutes, Seconds North and West.Map is currently displayed as 600 columns by 600 rows for a total of 360000 pixels. The map display represents 9600 meters east to west by 9600 meters north to south for a total of 92.1 square kilometers. The map display represents 31501 feet east to west by 31501 feet north to south for a total of 35.5 square miles.

Topographic maps and Black and white aerial photography for year 1990+-